

Categories

Air Engineer Certificates will be issued subject to the provisions of Air Regulations **for** any or all of **the following purposes:**

- "A" - **Inspection** of aircraft before flight.
- "B" - **Inspection** of aircraft after overhaul.
- "C" - **Inspection** of aero engines before flight.
- "D" - **Inspection** of aero engines after overhaul.

Qualifications

In order to qualify for an Engineer's Certificate, a candidate must,

- (a) Be:
 - 1) a British subject, or
 - 2) a subject of a foreign country which grants reciprocal aeronautical privileges to Canadians on equal terms and conditions with subjects of each foreign country.
- (b) Not be under 19 years of age.
- (c) **Satisfy the Minister by examination or otherwise as to his ability.**
- (d) **Be able to demonstrate sufficient ability** in the use of appropriate tools and materials that would be necessary to enable him to perform such repairs and replacements as his duties in maintenance of aircraft and / or aircraft engines might require.
- (e) **Furnish** three names and addresses of either:
 - (i) **employers** engaged in the manufacture of aircraft and / or aircraft engines; or engaged in the operation of aircraft;
 - (ii) **licensed air engineers** who can, from personal knowledge, vouch for the proficiency of the candidate in practical aeronautics.

Experience

Candidates for certificates in category "A" will be required to submit proof of having had **at least two (2) years' satisfactory experience:**

- 1) **both on** aircraft construction **and** maintenance, or
- 2) on maintenance alone.

Candidates for certificates in category "B" will be required to submit proof of having had **at least four (4) years' satisfactory experience:**

- 1) **both on** aircraft construction **and** maintenance, or
- 2) on maintenance alone.

Candidates for certificates in category "C" will be required to submit proof of having had **at least two (2) years' satisfactory experience :**

- 1) **both on** aero engine construction **and** maintenance, or
- 2) on construction alone.

Candidates for certificates in category "D" will be required to submit proof of having had **at least four (4) years' satisfactory experience:**

- 1) **both on** aero engine construction **and** maintenance, or
- 2) on construction alone.

In all categories Certificates will be limited to those types (Type Ratings) **of which the candidate has experience.**

School Training

Time spent at **technical schools or like institutions:**

- A. may be ***taken under consideration when assessing experience***, and
- B. may be ***permitted to count towards the experience required*** for an Air Engineer Certificate **under the following conditions:**

(A) A student having completed an Air Engineer's course at a technical school or like institution **may:**

- (a) on graduation from the school, be credited with the actual hours spent in the aircraft and aero engine shops of the school on practical work.

- (b) Such time may not exceed a credit of one year, and **will apply on "A" and "C" licences only.**

B. **A certificate of competency** *relative to the candidate's qualifications:*

- A. will be accepted from a licensed engineer in the employ of such school, and
- B. the hours of practical shop work should be verified by the principal or his assistant.

C. **The balance of the two years' experience required for an Air Engineer Certificate must be completed in full on actual operations under the supervision of a licensed air engineer.**

D. **No part of any school work will be admitted** as qualifying a candidate for categories **"B" or "D"**

Applications for Certificates

Application forms may be obtained on request from Civil Aviation Inspectors at the various District offices, or from the Civil Aviation Division, Department of Transport, Ottawa.

Applications for Certificates cannot be considered unless sufficient information is given in either the application or letters of competency concerning the candidate's experience on different makes and models of aircraft and aero engines.

Complete details are required, both in the application and letters of competency, stipulating the length of time connected with the aircraft industry on maintenance and/or construction duties and specifying the makes and models on which satisfactory work has been done.

Air Engineers may, from time to time, be examined on additional types, and if the examination is satisfactorily passed, the Certificate will be endorsed accordingly. **Such examinations may be either oral or written, at the discretion of the examiner.**

Examinations

CATEGORY "A" - Inspection of Aircraft Before Flight

The applicant must be familiar with the general principles of ***the systemic maintenance and examination of aircraft*** before flight, ***including knowledge of***

- (a) The method of checking the correct assembly of components, the rigging of an erected aircraft and the functioning of the flying controls, together with the correction of faults experienced during flight, the assembly and functioning of the landing gear including the correct rigging of skis, and the method of erection, truing up and maintenance of hulls and floats of wood, metal, or composite construction.
- (b) The defects and deterioration in wing coverings, timber and metal members, metal fittings, propellers (wood or metal), streamline wires, tie-rods, cables, shock absorbing devices and other parts of the aircraft structure that may be expected to occur as the result of wear and tear, or may be produced by slight mishaps experienced during normal operations of the aircraft, and a knowledge of the method of effecting minor repairs and replacements.
- (c) The construction and testing the installation of the flying instruments to ensure.
- (d) Compass adjustment, turn indicator, and electrical services, the method of inspecting and testing of the installation concerned in order to ensure correct functioning.
- (e) All applicable modifications contained in Technical Information Circulars issued by the Controller of Civil Aviation.
- (f) The entries which must be made in the appropriate log book, ***and the ability to:***
 - i) select data, and
 - ii) make other suitable entries to provide a useful history of the aircraft.

- (g) Air Regulations in so far as they affect air engineers.

CATEGORY "B" - Inspection of Aircraft After Overhaul

The applicant must be familiar with **the general principles of *the inspection of aircraft construction***, including knowledge of :

(a) Non-metallic materials and:

- (a) their relative specifications;
- (b) methods of identification, examination and testing;
- (c) characteristic defects which render them unsuitable and
- (d) precautions to be observed in their application to aircraft construction.

(b) Metallic materials and:

- (a) their relative specifications,
- (b) methods of identification, examination and testing;
- (c) characteristic defects which render them unsuitable and
- (d) precautions to be observed during processes of manufacture or repair - (heat treatment, welding, brazing, soldering, plating, etc.).

(c) The method of construction and examination of hulls and floats; effects of corrosion, causes of corrosion and protection against corrosion.

(d) The method of construction, examination and testing of aircraft parts and components - (fuselages, wings, propellers, tanks, radiators, pumps, cocks, etc.) corrosion and its prevention.

(e) The light tensile steels, strong aluminum alloys, etc., and the special workshop processes applicable to the materials used in the particular construction or constructions.

(i) Method of inspecting and testing the complete aircraft for correct assembly, installation of engine, controls, fuel, oil and water systems, cabin heaters, instruments, electrical services and other appliances.

(g) All applicable modifications contained in Technical Information Circulars issued by the Controller of Civil Aviation.

(h) The entries which must be made in the appropriate log book, **and the ability to:**

- i) select data, and
- ii) make other suitable entries to provide a useful history of the aircraft.

(i) Air Regulations in so far as they affect air engineers.

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CATEGORY "C" - Inspection of Aero Engines Before Flight

The applicant must be familiar with the general principles of inspection and testing of aero engine installation and maintenance, including knowledge of :-

The general construction of the particular type or types of engines for which the certificate is required together with the running time permissible before overhaul: the method and details of making a partial overhaul for the purpose of carbon removal, valve grinding and inspection, the defects likely to be encountered and the permissible allowances for wear and distortion; the methods of inspection and setting during and after this operation to ensure correct assembly and functioning.

(b) The methods of examining and testing the correct erection of the power plant and its accessories in the aircraft, including the fuel, oil, cooling, ignition, induction and exhaust systems, tanks, pipe lines, engine controls, propeller complete with hub, together with characteristic defects.

(c) The inspection, adjustment and testing of the power plant and its accessories to ensure correct functioning and power output after installation in the aircraft and during daily maintenance, including propellers, magnetos, carburettors, pumps, filters, engine starters and starting mechanisms and other parts or components on whose condition the correct functioning of the power plant depends; causes, effect, and prevention of external and internal corrosion.

(d) The correct grades of oil and other lubricants approved by the engine manufacturer for use on the particular engine or engines and their seasonal application; periods of running between oil changing.

(e) The minimum requirements for the fuel as specified or recommended by the engine manufacturer.

(f) The methods of inspecting and testing the installation of the instruments connected with the power plant concerned to ensure correct functioning, including pressure gauges, temperature and revolution indicators, boost gauges and tank contents gauges.

(g) The method or methods of starting engines in sub-zero temperatures, including precautions to be taken to minimize the risk of fire when naked flames are used during this operation.

(b) For the certificate to include supercharged engines: the functioning of superchargers and boost control.

(i) For the certificate to include Compression Ignition Engines: the fuel injection system and method of regulation.

(i) All applicable modifications contained in Technical Information Circulars issued by the Controller of Civil Aviation.

(k) The entries which must be made in the appropriate log book, **and the ability to:**

- i) select data, and
- ii) make other suitable entries to provide a useful history of the engine.

(l) Air Regulations in so far as they affect air engineers.

CATEGORY "D" - Inspection of Aero Engines After Complete Overhaul

The applicant must be familiar with the general principles of inspection of Aero-Engines during construction and / or complete overhaul, including knowledge of:

- (a) Materials used in engine construction and their relative specifications, methods of identification, re-examination and testing. Characteristic defects which render them unsuitable and precautions to be observed during processes of manufacture and repair - (heat treatment, white metalling, etching, brazing, soldering, protection against corrosion, etc.) -to ensure that the finished parts are in a satisfactory condition.
- (b) The general principles of testing and measurement of horse power, fuel and oil consumption, etc., as applied to aero engines.
- (c) The correct grades of oil and other lubricants approved by the engine manufacturer for use on the particular engine or engines and their seasonal application; periods of running between oil changing. Characteristic defects resulting from incorrect or insufficient lubrication; cause and effect of sludge formation
- (d) The minimum requirements for the fuel as specified or recommended by the engine manufacturer.
- (e) The general assembly, adjustment and methods of testing the correct erection of the components of the particular type or types of aero engine for which the certificate is required, including the safe allowances for deterioration, wear, distortion, balancing of parts, etc. The methods of adjustment, repair and testing of carburettors, engine starters, pumps, etc., that are fitted to the particular type of engine and of minor repairs to, and adjustment of, magnetos. Causes, effects and prevention of external and internal corrosion. Protection against corrosion during storage.
- (f) The methods of inspecting and checking the correct functioning of the ignition, carburation, lubrication and cooling systems on the engine during tuning up and testing.
- (g) For the certificate to include supercharged engines: the method of construction, testing and functioning of the supercharger unit and its' accessories.
- (h) For the certificate to include Compression Ignition Engines, the construction of the Fuel Injection System and the methods of fuel regulation.
- (i) All applicable modifications contained in Technical Information Circulars issued by the Controller of Civil Aviation.
- (i) The entries which must be made in the appropriate log book, **and the ability to:**
 - i) select data for, and
 - ii) make other suitable entries to provide a usefull history of the engine.
- (k) Air Regulations in so far as they affect air engineers.

PRACTICAL TEST

Tools and Materials

An air engineer, in the performance of his duties, may and often will be required to execute various repairs and replacements, for which **a certain amount of skill in the manipulation of materials and the use of hand tools is necessary.**

Candidates must satisfy the examiner that they possess the required skill for this work and may be required to demonstrate this fact by actual tests. These tests will be confined to simple operations as:

- (a) Use of files and scrapers.
- (b) Use of measuring instruments.
- (c) Marking off and drilling, to drawing.
- (d) Bending of sheet metal and tube.
- (e) Soldering and brazing.
- (f) Use of carpenter's hand tools.
- (g) Preparation and use of casein cement.
- (h) Sewing of fabric.
- (i) Splicing of control cables.
- (i) Riveting.
- (k) Fitting of Piston Rings.
- (l) Valve grinding, etc.

` (This does not imply that all repairs to aircraft must be effected by an air engineer. It is permissible for the actual work to be carried out by any competent mechanic, although the result must be passed by an air engineer holding a certificate in the appropriate category, before the aircraft can be accepted as airworthy).

AUTHORITY

Air Engineer Certificate, Category "A"

Air Engineer Certificate, Category "A" authorizes the holder to certify as airworthy any of the types of aircraft endorsed on his certificate, provided :

- (i) *That the annual Certificate of Airworthiness for the particular aircraft is in good standing.*
- (ii) That he is satisfied **by adequate and personal inspection** that **the aircraft is airworthy at the time he records this fact** in the aircraft log book.

In addition it authorizes the holder, after adequate inspection, **to certify as airworthy any** minor repairs and replacements which become necessary to these types of aircraft as the result of normal use.

For the purpose of this instruction, ***minor repairs and replacements are defined as those which do not affect the strength of the main structural members of the aircraft, except that such members may be replaced only by replacing the complete assembly in which they may occur***, in which case **the replacement assembly must have been duly certified as airworthy** by an air engineer holding the appropriate certificate.

NOTES:

1. A spar is a main structural member and also forms an integral part of a main assembly. Its repair or replacement must be certified by an air engineer licensed in Category "B".
2. A longeron forms an integral part of the fuselage and the same ruling applies to replacement of these components.

An Air Engineer licenced in Category "A" may, however, certify the aircraft as airworthy after the satisfactory replacement of the complete assembly containing either of these.

Air Engineer Certificate, Category "B"

Air Engineer Certificate, Category "B" authorizes the holder to certify as airworthy, after major repairs or complete overhaul, any of the aircraft endorsed on his Certificate provided:

- (a) That the aircraft conforms to the type for which the original Certificate of Airworthiness was issued, with the exception of such modifications as may have been ordered by the Minister in Technical Information Circulars issued by the Controller of Civil Aviation, or otherwise approved.
- (b) That he is satisfied by adequate and personal inspection that the strength of other repaired component or components is similar to the strength of the same components when in the new state, and that such repaired components or replacements conform to the approved drawings in material and dimensions excepting:-
 - (i) That damaged portions of welded steel tube fuselages and of other components of similar construction may be replaced provided:
 - 1) that **the location and design of the welds conform** to established practice for the type of repair, and

- 2) **that the original metallurgical structure of the material has been restored by suitable heat treatment in those components on which heat treatment is a requirement during manufacture.**

(ii) That repairs to other forms of construction are similarly in accordance with established practice.

(iii) That repairs to spars and other components as may be specifically directed by Technical Information Circulars conform to sketches or drawings which have been submitted to the Minister and approved by him for each repair.

(c) That he is satisfied by adequate and personal inspection that the aircraft has been assembled correctly, including the installation or insertion of all necessary locking devices as will prevent the accidental separation of any of the components, and that the protection against deterioration is reasonable for the purpose, having in mind the particular conditions under which the aircraft is required or expected to operate.

Air Engineer Certificate, Category "C"

The holder of an Air Engineer Certificate, Category "C" is authorized to *certify as airworthy any of the types of aircraft engines endorsed on his Certificate* provided:

(i) That no modifications to such engines have been made except as directed by the Minister in Technical Information Circulars or otherwise approved.

(ii) That he is satisfied by adequate inspection that the engine is airworthy at the time he records this fact in the appropriate log book.

In addition it authorizes the holder, after adequate inspection, to certify as airworthy all minor repairs, replacements and adjustments which may be required as a result of normal operation, or become apparent during partial overhaul.

Partial overhaul is specified for the purpose of this instruction as:-

(i) Removal of cylinders and attached valve gears for the purpose of carbon removal, valve reseating, etc., and general inspection not requiring the complete dismantling of the engine.

(ii) Removal of accessory units for examination, adjustment or repair.

Air Engineer Certificate, Category "D"

The holder of an Air Engineer Certificate, Category "D" is authorized to *certify as airworthy, after major repairs and/or complete overhaul, any engines of the types endorsed on his Certificate*, provided:

(a) That replacement parts conform in all respects to the manufacturer's approved drawings for such parts.

(b) That reasonable precautions against failure of any part has been taken by means of adequate inspection.

(c) That no modifications have been made or added except as ordered by the Minister in Technical Information Circulars, or otherwise approved by him.

(d) That he is **satisfied by adequate and personal inspection**, that the engine has been correctly assembled, including the installation or Insertion of all necessary locking devices as will prevent the accidental separation or derangement of any of the components.

(e) That the satisfactory functioning of the assembled engine and its essential accessories **has been proved** by adequate ground test.

(f) That the protection against deterioration is reasonable, having in mind the particular conditions under which the engine is required or expected to operate.

Period of Validity

Certificates are issued for a period of three years.

Renewals

Applicants for renewal of Air Engineer C)certificates **must be prepared to produce proof to the examining official** that:

1. they **are In possession of** a copy of all current Technical Information Circulars, **and**
2. **that they are familiar with** same.

Technical Circulars bear a number prefixed by the letter "T" thus T/1/32, T/17/34, etc.

Missing numbers may be obtained on request.

Applicants must state the serial number of the last Technical Information Circular received by them

Certificates are normally renewed for a period of three years.

- End -